

SOUTH AFRICA'S FIRST DINOSAUR REVISITED - HISTORY OF THE DISCOVERY OF THE STEGOSAUR *PARANTHODON AFRICANUS* (BROOM)

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ABSTRACT

The earliest dinosaur fossil recognized in South Africa was reported by William G Atherstone and Andrew G Bain in 1845, only four years after Sir Richard Owen had erected the order Dinosauria in 1841. The science of dinosaur palaeontology was still much in its infancy at the time. This fossil was initially incorrectly identified and catalogued, and it took 136 years before its affinities were correctly interpreted and it was finally given the name *Paranthodon africanus* (Broom) by Galton and Coombs (1981).

Keywords: *Paranthodon africanus*; history

HISTORICAL BACKGROUND TO THE DISCOVERY

Discoveries of fossil vertebrates, including dinosaurs, were being made in the British colonies like South Africa and Australia in the early part of the 19th century, but, because of a lack of expertise, the material was usually sent back to England to be studied and described by palaeontologists like Richard Owen at the British Museum of Natural History (now the Natural History Museum) in London.

It is not widely known that the earliest report of the discovery of dinosaur bones in South Africa was made early in 1845 by two eminent pioneers of science in the Eastern Cape, William Guybon Atherstone and Andrew Geddes Bain (Fig. 1).

At the close of the Sixth Frontier War in the Eastern Cape (1834-35), Bain, a settler of Scottish descent, was appointed to the post of Assistant Engineer in the Royal Engineers to supervise the construction of military roads on the frontier, in the country around Grahamstown. His first assignment in 1837 was the construction of the "Queen's Road", between Grahamstown and Fort Beaufort through the Ecce Pass. As his daily work brought him into close contact with landforms, rocks, minerals and fossils, Bain developed a keen interest in the then relatively new science of geology. He was the first person to attempt to place the rock types he encountered over the vast tracts of the Cape Colony into a geological framework (Bain, 1857) and he can legitimately be regarded as the "father of South African geology".

Through this interest he soon made the acquaintance of a local medical practitioner, William Guybon Atherstone, a man whose many interests included geology and who could aptly be described as a "Victorian gentleman of science".

Early in 1845 Atherstone, Bain and three of his children, took "a holiday excursion for the purpose of geological exploration" in the Eastern Cape (Atherstone, 1857:528). Atherstone did not initially set out with the main party from Grahamstown as he had

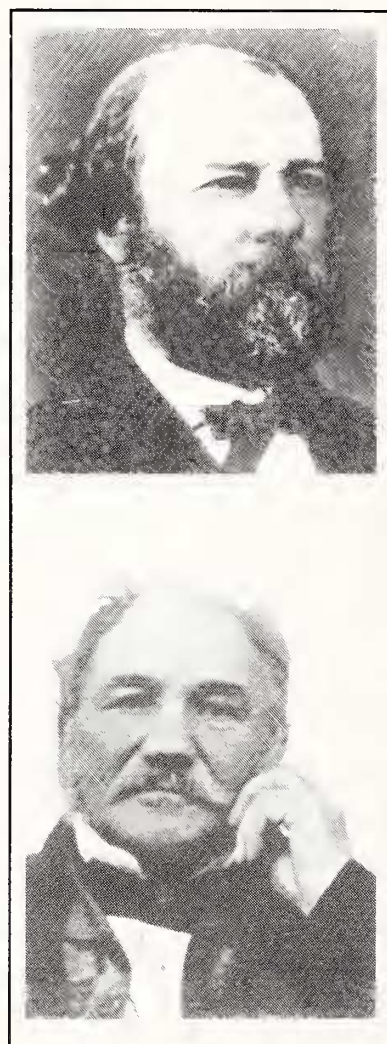


Figure 1. W G Atherstone (above) and A G Bain

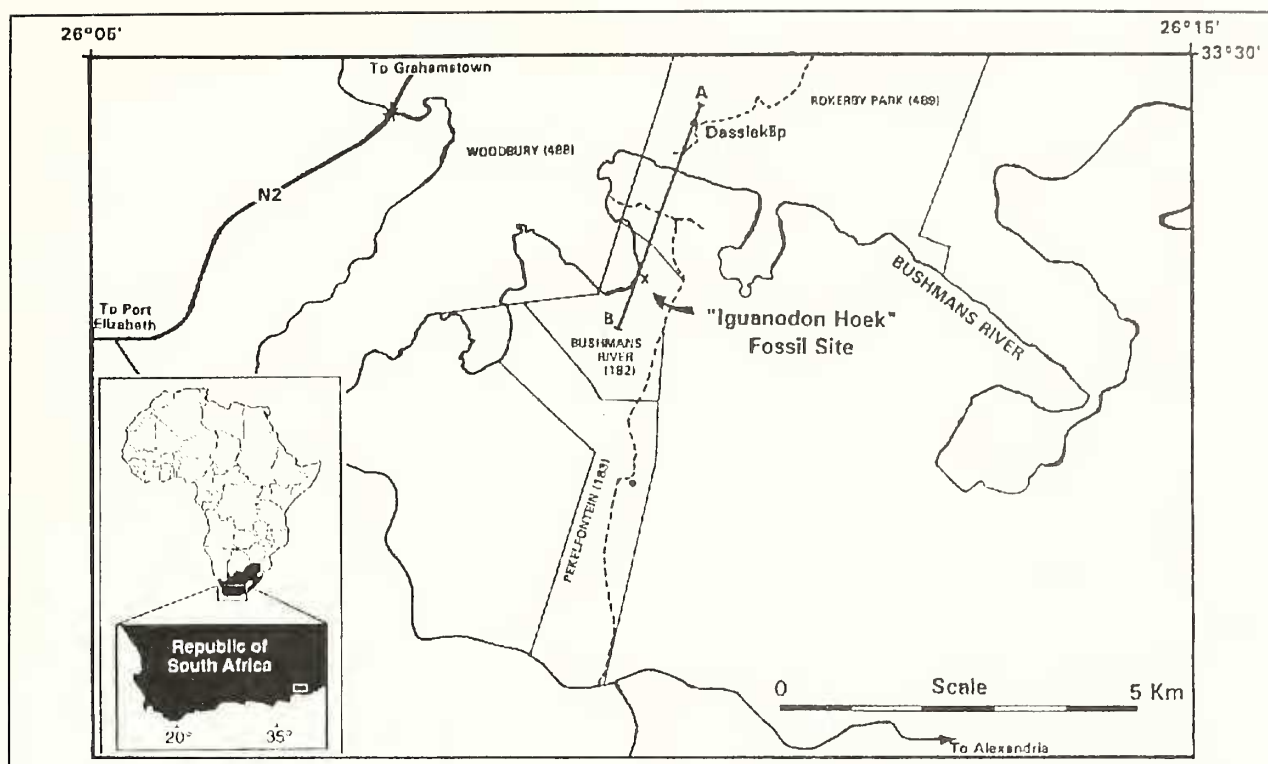


Figure 2. Map of portion of the Bushmans River Valley, showing locality of "Dassieklip".

been called away to a country patient and was only able to join them late the following day. Bain and his children had travelled from Grahamstown towards Port Elizabeth and had set up camp in the vicinity of the farm Dassieklip on the Bushmans River, about half-way between Grahamstown and Port Elizabeth (Fig.2). When Atherstone arrived at the camp he was greeted by Miss Jeanie Bain who was "slowly staggering up the hill under some heavy load" of stones (Atherstone, 1857:529). He immediately went to help her and saw that they were not stones but fossilised "bones bigger than those of an ox!". The discovery of these large bone fragments caused some excitement and the question of their identity and origin generated considerable discussion late into the night.

From the textures of the bone Atherstone and Bain concluded that they were those of a very large reptile. What was lacking at that stage, though, was a diagnostic bone to give some clue as to the identity of the animal. The following day Atherstone found an upper jaw bone which included a "row of black serrated and fluted teeth" (Atherstone, 1957:530) (Fig.3).

At the time, based largely on the fluted nature of the teeth, Atherstone and Bain were

convinced that the animal was in some way related to *Iguanodon*, a dinosaur that had been discovered in 1822 by Mary Mantell in Sussex, (southern) England, and described by her husband, Gideon Mantell, in 1825.

Atherstone coined the name "*Cape Iguanodon*" for the fossil and named the discovery site "*Iguanodon Hoek*", a name which was unfortunately never formally adopted. This discovery is now accepted as the first record of a dinosaur find in South Africa, made only 23 years after the original discovery of *Iguanodon* in England – the second dinosaur ever to be formally described and named.



Figure 3. Left mesial view of the lower jaw of *Paranthodon africanus*. Now in the natural History Museum, London.

EVENTS LEADING TO IDENTIFICATION

The science of palaeontology was still in its infancy at the time of this discovery and Atherstone and Bain were only making educated guesses about the nature of the animal. They therefore resolved to send the fossil to Richard Owen, who was at that time regarded as the most eminent palaeontologist in England, based at the British Museum in London. It was Owen who, at a meeting in Plymouth of the British Association for the Advancement of Science in 1841, coined the term "Dinosauria" (Owen, 1842) to describe the unusual group of large extinct reptiles that he was studying (Dinosauria - Greek meaning "terrible lizards"). Unfortunately only the upper jawbone and two additional skull fragments are all that remain of this find and are now housed in the Natural History Museum in London (BMNH 47338). No record of Atherstone's "bones bigger than those of an ox" have survived and it is not known if they were ever dispatched to London by Atherstone or Bain.

It took Owen 31 years before he published the first description of the Bushmans River fossil (Owen, 1876). Atherstone, frustrated at this delay, commented on this lengthy interval in 1871 in an account of a trip which he made between Grahamstown and Port Elizabeth:

"Then over the Komga [River] Now we pass Dassieklip, where the rocks change entirely. There, to the left, lies 'Iguanodon-Hoek', where Bain and I years ago exhumed huge bones of some extinct Saurians - one, from the jaw and serrated teeth, I fancy some huge Iguanodon. They lie still in the vaults of the British Museum, unknown, unnamed, unexamined. All that is known of them you will find in the Eastern Cape Monthly Magazine for 1857." (Atherstone, 1871:81).

The process of establishing the exact nature of the animal took a long time and a number of milestone events took place from 1845, finally culminating in the identification of the animal as *Paranthodon africanus* (Broom), a plant-eating dinosaur belonging to the Stegosauridae. Members of this group of dinosaurs are distinct in having plates on their backs and spikes on their tails - the plates were probably used for sexual display and perhaps as radiators for regulating body temperature (Galton, 1990) and the spikes were used for defence.

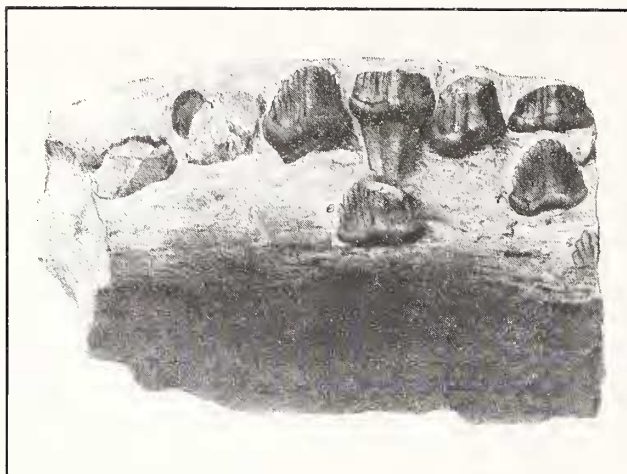


Figure 4. Owen's drawings of the jaw fragment (from Owen, 1876).

Dinosaur fossil discoveries and related events prior to the 19th century discovery of the Bushmans River fossil, have been presented by Weishampel *et al.* (1990), and by Sarjeant (1997a & 1997b). Some of these events are nevertheless worth repeating and are presented chronologically below:

Some palaeontological events that took place in England prior to 1845.

1809 -

A lower limb-bone of a large unknown animal is collected at Cuckfield by William Smith (the "father of English geology"). The fossil is deposited at the British Museum in London and years later is identified as that of *Iguanodon*.

1818 -

Bones of what is called *Megalosaurus* by James Parkinson (but not formally described by him) are discovered at Stonesfield, Oxfordshire in England; they are not described until years later.

1822 -

Mary Ann Mantell finds the teeth of an unknown animal near Lewes, Sussex (described in 1825 by her husband as those of *Iguanodon*) (Mantell, 1825).

1824 -

Buckland publishes the first formal description of a dinosaur, using the name *Megalosaurus* which Parkinson had cited several years earlier in connection with the Stonesfield fossil (Buckland, 1824).

1825 -

Gideon Mantell (1825) publishes a description of *Iguanodon*, based on the material

found by his wife in 1822.

1841 -

Richard Owen, of the Natural History Museum, London, proposes the ordinal taxon Dinosauria for these reptiles (Owen, 1842).

Events relating to the discovery and ultimate identification of the Bushmans River dinosaur.

1845 -

W G Atherstone and A G Bain discover the fossil of the "Cape *Iguanodon*" in the Bushmans River Valley near Dassieklip (Atherstone, 1857).

1849 & 1853 -

Bain sends collections of South African fossils to Sir Richard Owen at the British Museum in London for identification. Included in this general collection are the lower jaw and some skull fragments of the "Cape *Iguanodon*" from the Bushmans River (Bain, 1857; Lydekker, 1890).

1857 -

Atherstone publishes the account of their trip to the Bushmans River Valley and the discovery of this fossil (Atherstone, 1857).

1871 -

Atherstone (1871) notes that the "Cape *Iguanodon*" has still not been identified and that it is still housed in the Natural History Museum in London.

1876 -

Sir Richard Owen publishes an illustrated catalogue of the fossil reptiles of South Africa which includes a description and partial sketch of the fossil of "Cape *Iguanodon*", naming it *Anthodon serrarius* (Owen, 1876). It is at this time that Owen made a fundamental error which introduced confusion about this fossil into the literature. He unwittingly includes this fossil with the skull of a pareiasaur, *Anthodon serrarius*, and records the locality of both specimens as being from Bushmans River. (The *Anthodon serrarius* material was in fact collected by Bain "near Styl-Kranz, Sneewberg range" in the Karoo and would therefore have been some 100 million years older than the Bushmans River material. At this time Owen also includes several groups of animals now known not to be dinosaurs, such as the pareiasaurs, in his newly created taxon Dinosauria.)

1890 -

Richard Lydekker, a curator in palaeontology at the British Museum of Natural History in London, corrects Owen's mistake regarding the locality yet fails to distinguish the fossils as two unrelated species (Lydekker, 1890).

1909 -

Robert Broom of South Africa visits the British Museum (Natural History) and examines the Bushmans River material. He concludes that the fossil was in fact from a herbivorous dinosaur and notes that "..... when we compare the teeth with those of Cretaceous reptiles of other parts we find that they are strikingly similar to those of some herbivorous Dinosaurs." (Broom, 1910:25). Broom also notes a striking similarity between the Bushmans River teeth and a tooth of *Palaeoscincus costatus*, an ankylosaur; ankylosaurs are now regarded as closely related to stegosaurs. He suggests that as the Bushmans River teeth are so similar to those of the *Palaeoscincus costatus* it is probable that they belong to the same genus and proposes that the Bushmans River specimen be provisionally named *Palaeoscincus africanus*, emphasizing that it is definitely not the pareiasaur *Anthodon serrarius* and pretty certainly dinosaurian.

1913 -

E H L Schwarz, head of the Department of Geology at Rhodes University and students revisit the discovery site and find more fossil bone, including a heavy femoral head, the head of a tibia, some vertebrae and numerous smaller fragments (Schwarz, 1913). These specimens (a total of 22 fragments) are housed in the Albany Museum (AM.3755). In describing this material Schwarz, however, does not adopt the name proposed by Broom and persists with the incorrect *Anthodon serrarius*. (Recent examination of this material suggests that the Schwarz material may not be from a stegosaur but rather from some large sauropod. The material was, however, collected in the general area where Atherstone found the stegosaur.)

1929 -

Frans Baron Nopsca (1929), apparently unaware of the name proposed by Broom, has a fresh look at the Bushmans River fossil at

the British Museum (Natural History) and recognises that it is in fact a stegosaur, and names it *Paranthodon oweni*.

1972 -

Walter P Coombs re-examines the fossil and requests that it be prepared for detailed study.

1981 -

Peter M Galton and Walter P Coombs tie up the loose ends of this saga in their paper "*Paranthodon africanus* (Broom) - A stegosaurian dinosaur from the lower Cretaceous of South Africa" (Galton & Coombs, 1981).

DISCUSSION

As can be seen from the sequence of events, confusion surrounded this dinosaur fossil for 136 years. A project was initiated in 1991 to relocate the original discovery site in the Bushmans River Valley. Efforts to find more fossil bone were focused on exposures of early Cretaceous fluvial siltstones and mudstones of the Kirkwood Formation (McLachlan & McMillan, 1976), the colour of the exposed sediments corresponding to the fossil bone.

These sediments are regarded as Valanginian in age (McMillan, 1999).

Initial excavations in 1992 were carried out at two fossil sites in erosion gullies in the area. They produced an abundance of fragmentary bone which, where possible, have been pieced together. It is likely that one of these sites is in fact Atherstone and Bain's original discovery site. *Ad hoc* monitoring of the site is ongoing as new fossil bone fragments are constantly being exposed by erosion of the soft mudstone (de Klerk *et al.*, 1992).

While making this investigation it was realized that the 1845 discovery was the first dinosaur fossil to have been reported from South Africa and possibly from Africa. No earlier references to dinosaur fossil discoveries in Africa have been found. It was also the first stegosaur to be found, the first of the 14 species now recognised (Galton, 1990); the first stegosaur in the literature was *Stegosaurus armatus*, described by the renowned American palaeontologist Othniel Charles Marsh in 1877. At the time the Bushmans River stegosaur had not been recognised for what it was.

The year 1995 marked the 150th anniversary of the discovery of *Paranthodon* and, to

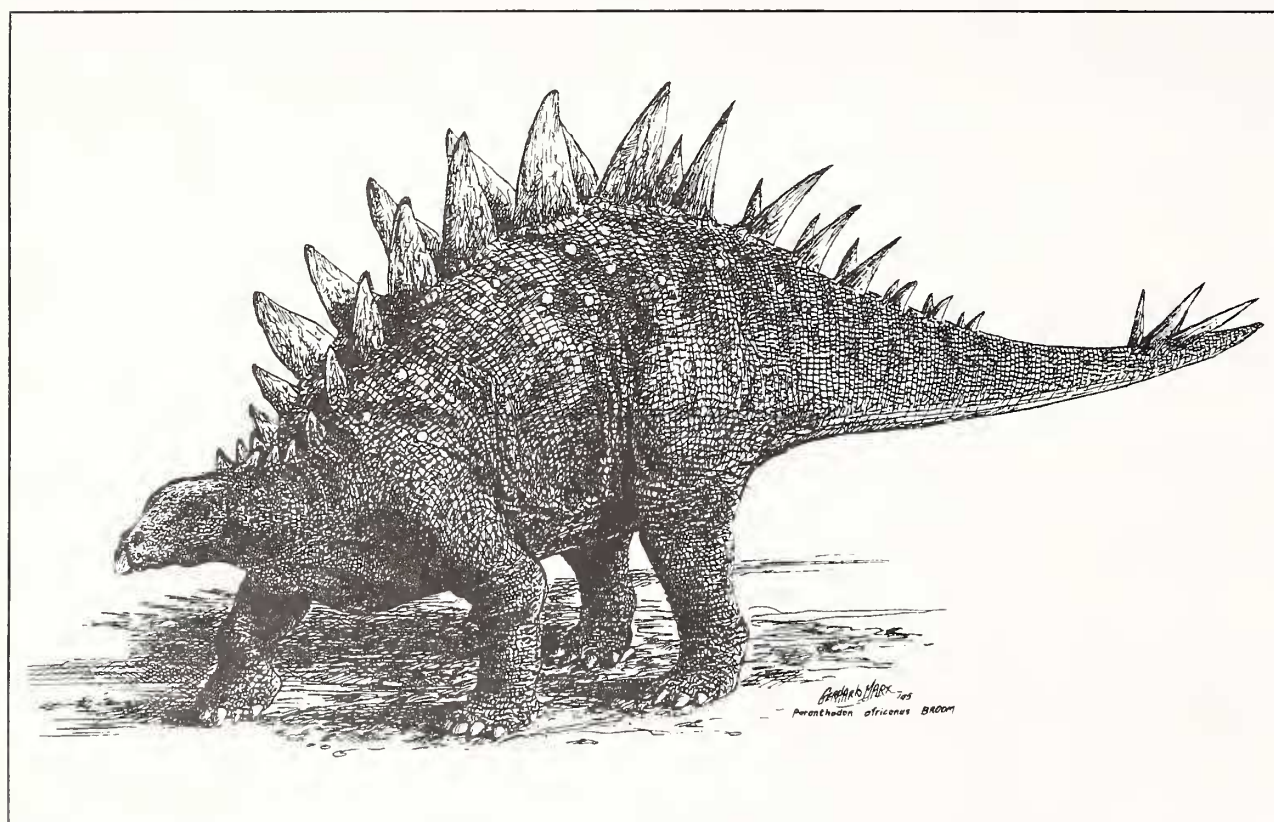


Figure 5. The Albany Museum reconstruction of *Paranthodon africanus*.

commemorate this event, a five-metre long life-sized reconstruction of the animal was constructed at the Albany Museum in Grahamstown, South Africa (Fig.5). The post-cranial morphology of the reconstruction is loosely based on *Kentrosaurus* from the late Jurassic Tendaguru Basin in Tanzania (Hennig, 1915) and to a lesser extent on *Tuojiangosaurus* from the late Jurassic of Sichuan in China (Dong, 1992). The reason for basing the reconstruction on these two stegosaurs is that the form of the teeth of *Paranthodon* bears closer similarity to these species than to *Stegosaurus* from the late Jurassic Morrison Formation in the USA. In addition, there is a close similarity in body shape between *Kentrosaurus* and *Tuojiangosaurus*, both of which have back plates which are narrower and more pointed than those of *Stegosaurus* (Dong, 1988). The similarities between the teeth of *Paranthodon* and *Kentrosaurus* suggest they are more closely related than either is to *Stegosaurus*, as is perhaps to be expected because of their geographic proximity. It has also been suggested that the apparent relationship between *Kentrosaurus*, *Paranthodon* and the Indian stegosaur *Dravidosaurus* may be an indication that Gondwana stegosaurs evolved in the late

Jurassic and Cretaceous in isolation from the northern hemisphere Laurasian stegosaurs (Bonaparte, 1986).

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